

Eliciting imitation in early infancy

Andrew N. Meltzoff, Lynne Murray, Elizabeth Simpson, Mikael Heimann, Emese Nagy, Jacqueline Nadel, Eric J. Pedersen, Rechele Brooks, Daniel S. Messinger, Leonardo De Pascalis, Francys Subiaul, Annika Paukner and Pier F. Ferrari

The self-archived postprint version of this journal article is available at Linköping University Institutional Repository (DiVA):

<http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-155562>

N.B.: When citing this work, cite the original publication.

This is a copy of the published version of the following article:

Meltzoff, A. N., Murray, L., Simpson, E., Heimann, M., Nagy, E., Nadel, J., Pedersen, E. J., Brooks, R., Messinger, D. S., De Pascalis, L., Subiaul, F., Paukner, A., Ferrari, P. F., (2019), Eliciting imitation in early infancy, *Developmental Science*, 22(2), e12738. <https://doi.org/10.1111/desc.12738>

which has been published in final form at:

Original publication available at:

<https://doi.org/10.1111/desc.12738>

Copyright: Wiley-Blackwell

<http://wiley.com/>



Eliciting Imitation in Early Infancy

Andrew N. Meltzoff¹

University of Washington

Lynne Murray²

University of Reading & University of Cape Town

Elizabeth Simpson³

University of Miami

Mikael Heimann⁴

Linköping University

Emese Nagy⁵

University of Dundee

Jacqueline Nadel⁶

Hôpital de la Salpêtrière

Eric J. Pedersen⁷

University of Colorado

Rechele Brooks¹

University of Washington

Daniel S. Messinger³

University of Miami

Leonardo De Pascalis⁸

University of Liverpool

Francys Subiaul⁹

George Washington University

Annika Paukner¹⁰

National Institute of Child Health and Human Development

Pier F. Ferrari¹¹

Université Claude Bernard, Lyon 1

Author note

Andrew N. Meltzoff¹, Institute for Learning & Brain Sciences, University of Washington, Seattle, WA, USA; Lynne Murray², Department of Psychology, University of Reading, Reading, UK & Department of Psychology, University of Cape Town, Cape Town, South Africa; Elizabeth Simpson³, Department of Psychology, University of Miami, Coral Gables, Florida, USA; Mikael Heimann⁴, Department of Behavioral Sciences and Learning, Linköping University, Linköping, Sweden; Emese Nagy⁵, School of Psychology, University of Dundee, Dundee, UK; Jacqueline Nadel⁶, Centre Emotion, Hôpital de la Salpêtrière, Paris, France; Eric J. Pedersen⁷, Department of Psychology and Neuroscience, University of Colorado, Boulder, CO, USA; Rechele Brooks¹, Institute for Learning & Brain Sciences, University of Washington, Seattle, WA, USA; Daniel S. Messinger³, Department of Psychology, University of Miami, Coral Gables, Florida, USA; Leonardo De Pascalis⁸, Department of Psychological Sciences, University of Liverpool, Liverpool, UK; Francys Subiaul⁹, Department of Speech, Language, & Hearing Sciences, George Washington University, Washington, DC, USA; Annika Paukner¹⁰, Eunice Kennedy Shriver National Institute of Child Health and Human Development, Rockville, MD, USA; Pier F. Ferrari¹¹, Institut des Sciences Cognitives – Marc Jeannerod, Université Claude Bernard, Lyon 1, Lyon, France

Address for correspondence: Andrew N. Meltzoff, Institute for Learning & Brain Sciences, University of Washington (Box 357988), Seattle, WA 98195, USA; email: Meltzoff@uw.edu

Eliciting Imitation in Early Infancy

We (Meltzoff et al., 2018) described how Oostenbroek et al.'s (2016) design likely dampened infant imitation. In their commentary, Oostenbroek et al. (in press) argue that our points are post hoc. It is important for readers to know that they are not. Our paper re-stated “best practices” described in published papers. Based on the literature, the design used by Oostenbroek et al. (2016) would be *predicted* to dampen infant imitation.

First, Oostenbroek et al.'s (2016) test periods were too brief. The stimulus presentation for each type of gesture was too short to ensure that neonates saw the display. The response measurement period did not allow neonates sufficient time to organize a motor response. Meltzoff and Moore [M&M] (1983a, 1994) introduced experimental procedures *specifically designed* to address these issues (also, Simpson et al., 2014). Oostenbroek et al. did not capitalize on these procedural advances.

Second, Oostenbroek et al. allowed uncontrolled experimenter-infant interactions during the test session itself. Previous papers on imitation provided analyses of how uncontrolled interactions with the experimenter can introduce “noise” in experiments of facial imitation (M&M, 1983b, 1994).

Third, Oostenbroek et al. used suboptimal eliciting conditions. Neonates cannot support their own heads; in Oostenbroek et al., infants' heads were allowed to flop from side-to-side unsupported on the experimenter's lap while the experimenter gestured with both hands. In addition, papers have listed techniques for maximizing visual attention (controlled lighting, homogeneous background) (M&M, 1994). Oostenbroek et al. tested infants on a couch in the home.

Despite a design that would blunt imitation, our re-analysis of Oostenbroek et al.'s data showed a response pattern that is consistent with the imitation of tongue protrusion (TP). In their commentary, Oostenbroek et al. (in press) now propose limiting analyses to a subset of their original controls. We re-analyzed their data accordingly. Again, the results support early imitation. The cross-sectional data (their Table S4) collapsed across age show significantly more infant tongue protrusion in response to the TP demonstration than to the mean of the six dynamic face controls (mouth, happy, sad, mmm, ee, and click): $t(104)=4.62$, $p=.00001$. The results are also significant using a narrower subset of stimuli (mouth, happy, and sad): $t(104)=3.20$, $p=.0018$. These results rule out arousal, because the adult TP demonstration was significantly more effective in eliciting infant tongue protrusions than the category of dynamic face controls. Tongue protrusion matching is a robust phenomenon successfully elicited in more than two dozen studies (reviews: M&M, 1997; Nagy et al., 2013; Simpson et al., 2014).

There are more general lessons to be drawn. Psychology is experiencing what some call a “replication crisis.” Those who attempt to reproduce effects have scientific responsibilities, as do original authors. Both can help psychology become a more cumulative science. It is crucial for investigators to label whether or not a study is a direct replication attempt. If it is not a direct replication, procedural alterations and associated limitations should be discussed. It sows confusion to use procedures that are already *predicted* to dampen effects, without alerting readers. Psychology will be advanced by more stringent standards for reporting and evaluating studies aimed at reproducing published effects.

Infant imitation is a fundamental skill prior to language and contributes to the development of social cognition. On this both Oostenbroek et al. and we agree.

References

- Meltzoff, A.N., & Moore, M.K. (1983a). Newborn infants imitate adult facial gestures. *Child Development, 54*, 702-709.
- Meltzoff, A.N., & Moore, M.K. (1983b). The origins of imitation in infancy: Paradigm, phenomena, and theories. In L.P. Lipsitt & C.K. Rovee-Collier (Eds.), *Advances in infancy research* (Vol. 2, pp. 265-301). Norwood, NJ: Ablex.
- Meltzoff, A.N., & Moore, M.K. (1989). Imitation in newborn infants: Exploring the range of gestures imitated and the underlying mechanisms. *Developmental Psychology, 25*, 954-962.
- Meltzoff, A.N., & Moore, M.K. (1994). Imitation, memory, and the representation of persons. *Infant Behavior and Development, 17*, 83-99.
- Meltzoff, A.N., & Moore, M.K. (1997). Explaining facial imitation: A theoretical model. *Early Development and Parenting, 6*, 179-192.
- Meltzoff, A.N., Murray, L., Simpson, E., Heimann, M., Nagy, E., Nadel, J., ... Ferrari, P.F. (2018). Re-examination of Oostenbroek et al. (2016): Evidence for neonatal imitation of tongue protrusion. *Developmental Science, 21*, e12609.
- Nagy, E., Pilling, K., Orvos, H., & Molnar, P. (2013). Imitation of tongue protrusion in human neonates: Specificity of the response in a large sample. *Developmental Psychology, 49*, 1628-1638.
- Oostenbroek, J., Suddendorf, T., Nielsen, M., Redshaw, J., Kennedy-Costantini, S., Davis, J., ... Slaughter, V. (2016). Comprehensive longitudinal study challenges the existence of neonatal imitation in humans. *Current Biology, 26*, 1334-1338.

Oostenbroek, J., Redshaw, J., Davis, J., Kennedy-Costantini, S., Nielsen, M., Slaughter, V., & Suddendorf, T. (in press). Commentary: Re-evaluating the neonatal imitation hypothesis. *Developmental Science*.

Simpson, E.A., Murray, L., Paukner, A., & Ferrari, P.F. (2014). The mirror neuron system as revealed through neonatal imitation: Presence from birth, predictive power and evidence of plasticity. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 369, 20130289.